EPA Response to LWG's March 25, 2015 Comments on the Portland Harbor FS Section 2

1. Contaminants of Concern (COCs) and Preliminary Remediation Goals (PRGs)
COCs and PRGs should only be selected for those contaminants and exposure scenarios identified as being site-related and posing potentially unacceptable risk in the approved baseline human health and ecological risk assessments. Then, from among that list of PRGs, the FS should *focus* on PRGs for which acceptable risk levels can be achieved through a sediment-only cleanup. The June 2014 comments detail examples and specific issues related to the LWG's concerns on these points. Also, the June 2014 comments note regarding ARARs that EPA guidance states the following:

> "As a general policy and in order to operate a unified Superfund program, EPA generally uses the results of the baseline risk assessment to establish the basis for taking a remedial action using either Section 104 or 106 authority. If the baseline risk assessment and the comparison of exposure concentrations to chemical-specific standards indicates that there is no unacceptable risk to human health or the environment and that no remedial action is warranted, then the CERCLA Section 121 cleanup standards for selection of a Superfund remedy, including the requirement to meet applicable or relevant and appropriate requirements (ARARs), are not triggered" (EPA 1991).

While EPA has made a first step toward focusing the PRG list in its analysis in Table 2.1-2 "Summary of COC Selection Process," EPA has not fully not addressed this prior LWG comment and continues to include in Section 2 many non-risk-based PRGs and PRGs for media that do not clearly relate to site-related releases, exposure pathways posing risk, or to a sediment-only cleanup. For example, in Table 2.1-3, EPA notes numerous PRGs that were selected because they are "S – Known upland source not evaluated in the risk assessment" or "M – Media associated with exposure point risk." These chemicals were not necessarily found to pose risk in the media for which a PRG was designated, and therefore, should not have PRGs for these media for the sediment remedy.

EPA Response:

Both the baseline human health risk and the baseline ecological risk assessments concluded that there is unacceptable risk at the site and therefore CERCLA action is warranted. Thus, ARARs are triggered. EPA will clarify the FS Section 2 text to identify COCs based on potential unacceptable risk or ARARs. In addition to contaminants identified as potentially unacceptable risk in the risk assessments, the potential for a contaminant to pose or contribute to unacceptable risk based on the conceptual site model is also a basis for including a contaminant as a COC and establishing a PRG, particularly where the contaminant is exceeding an ARAR. The PRGs have been established and the final remediation goals/cleanup levels will be developed considering the factors specified in 40 CFR 300.430(e)(2)(i). EPA has reviewed the COCs and PRGs and has revised the tables.

2. Sediment Background Concentrations and Equilibrium Levels

Development and use of sediment background concentrations in the FS should be consistent with the conceptual site model for the Portland Harbor Superfund Site (Site) based on the data collected. In June 2014, the LWG provided an attachment to the comments describing the need for development of "equilibrium" levels for Portland Harbor that used other methods beyond EPA's directed statistical analyses of upstream sediment background data. EPA has not responded in writing to the LWG's proposal, although it has indicated orally that this concept would be considered for FS Section 4. The LWG continues to recommend that the equilibrium concept be factored into PRG selection because equilibrium levels represent reasonably achievable sediment concentrations for the harbor. EPA sediment remediation guidance is clear that Remedial Action Objectives (RAOs), PRGs, Remedial Goals (RGs), and eventual cleanup levels should represent values that are achievable by implementation of the sediment remedy alone (EPA 2005; p. 2-15).

EPA Response:

EPA will conduct an equilibrium evaluation in Section 4 of the FS. The most appropriate means to evaluate whether RAOs or PRGs are achievable by any of the alternatives being developed in Section 3 of the FS is to conduct the detailed evaluation in Section 4 of the FS using the first seven NCP criteria. This information will be considered in developing the final remediation goals/cleanup levels.

3. PRG Consistency with Risk Assessments and Risk Management Principles

Risk-based PRGs for evaluating cleanup alternatives should be consistent with the spatial scales of the exposure scenarios used to characterize risk in the approved baseline human health and ecological risk assessments. Risk-based PRGs should also be developed based on technically sound principles and application of risk management principles, as called for in EPA's regulation and guidance (see LWG's June 2014 comments for guidance quotes). Per these precepts, the LWG had requested that EPA greatly reduce the number of COCs and PRGs consistent with its practice at other sediment remediation sites. Instead EPA increased the number of COCs and PRGs since the last PRGs table was made available to the LWG.

For example, in Section 2.2.1, EPA indicates that "[c]ontaminants found to pose a lifetime cancer risk greater than 1 × 10-6 or hazard quotients (HQs) greater than 1 were identified as contaminants posing unacceptable risks." As a matter of risk management, this approach is the most conservative that EPA could apply. The National Contingency Plan (NCP) incorporates a flexible threshold for EPA's determination of risk acceptability. Risks greater than 1x10-4 generally require remediation, risks less than 1x10-6 are generally considered acceptable, and risks between these values may or may not require action depending on site-specific circumstances. (Further, as discussed more below, this text should be changed to "posing potentially unacceptable risks" [emphasis added] in order to be consistent with the risk assessments.) Also, EPA notes in Section 2.2.2.1, "The [risk-based PRGs] were developed for COCs in sediment and biota tissue, assuming target cancer risk levels of 10-6 and 10-4, and a target non-cancer Hazard Quotient of 1, for each of the receptors evaluated in the BHHRA and

using the methodology described in Appendix B1." However, the human health PRG Tables 2.2-4 through 2.2-7 do not show any PRGs based on a cancer risk level of 10-4. These PRGs are only presented in the appendices and should be moved forward into the main text tables.

In 2012, EPA Headquarters asked the LWG to obtain additional Small Mouth Bass (SMB) fish tissue samples from the site and from upstream areas that overlap with background sediment sampling locations. The LWG obtained and analyzed these samples. When the human health risk associated with the consumption of resident fish (SMB) from the upstream samples is calculated, cancer risk levels are present in the range of 10-5 and Hazard Quotients that in some cases exceed 50. Accordingly, regardless as to the methods used to calculate sediment background concentrations, these data demonstrate that health risk associated with the consumption of resident fish (SMB) from background areas exceed the higher-end criteria of acceptability (greater than 10-6 in the case of cancer risk and Hazard Quotients greater than 1 in the case of non-cancer risks). Based on the 2012 fish tissue data, at least 5 miles of the site extending from River Mile (RM) 4 through RM 8 are already within the risk range associated with consumption of the upstream fish. EPA's policy concerning background risk is straightforward:

> "Generally, under CERCLA, cleanup levels are not set at concentrations below natural background levels. Similarly, for anthropogenic contaminant concentrations, the CERCLA program normally does not set cleanup levels below anthropogenic background concentrations" (EPA 2002).

It is essential that Region 10 base its cleanup levels on the actual background conditions and risks as evidenced in both the 2002 and 2012 Upstream Fish Tissue Data.

Also, it appears that EPA is still calculating and applying many PRGs on spatial and temporal scales that are inappropriate based on the exposure assessment in the BLRAs or on the legal application of potential Applicable or Relevant and Appropriate Requirements (ARARs). For example, EPA presents Figure 2.2-2 entitled "Comparison of Risk Areas to be Remediated," which appears to define "remediation areas" based on a point-by-point (in both time and space) application of all PRGs developed by EPA. Also, in Section 2.2.2.2, EPA indicates that "[t]he lowest value for each media was selected as the risk-based PRG for RAOs 5 and 6 to be protective of all potential receptors." However, the PRGs for different ecological receptors are applied on different spatial scales, so applying the lowest PRG to individual locations throughout the harbor is inconsistent with how BLRAs were conducted.

To the extent that PRGs in Table 2.2-1 "Summary of Portland Harbor PRGs by RAO and Media" are based on potential Oregon ARARs, they need to be applied in the manner those potential ARARs would be applied under Oregon law. See LWG, Background Document: Application of Oregon Water Quality Standards, Tab 7 (provided to EPA July 7, 2008). For example, cadmium was identified as a COPC in the BERA, and its PRG in Table 2.2-1 for RAO 7 (aquatic direct contact/ingestion) is set by reference to Oregon toxics criteria for aquatic protection, OAR 340-041-0033, Table 30. With respect to the temporal application of this criteria, Table 30 notes that these Oregon criteria are not to be applied based on single grab samples. Rather, they are applied "as a 96-hour (4 days) average concentration [which] should

not be exceeded more than once every three years." With respect to the spatial scale of application, this criteria would not be applied on a point-by-point basis, but rather would include application of the implementation provisions of Oregon's water quality standards including, for example, use of regulatory mixing zones. Id., Tab 7 at 8-9 and Tab 8. Finally, EPA's Table 2.2-1 also appears to apply toxics criteria from OAR 340-041-0033, Table 30, to porewater, which is an application that would not be made under Oregon law.

Also, EPA indicates in Section 2.2.2.1, "The risk-based PRGs for RAOs 1 and 2 represent the lowest value in each media (beach or in-water sediment, and fish/shellfish tissue) to be protective of all potential receptors." However, this direct comparison is inappropriate because these PRGs should not be applied the same way if the comparison is to be consistent with the BHHRA. The lowest value selected across all scenarios may not be appropriate to apply in certain areas or over certain spatial scales. For example, recreational beach user PRGs only apply to recreational beaches, and fish consumption PRGs are for subsistence fishers only (which is generally a site-wide exposure). Showing the lowest value by media loses the context for how the PRGs should be applied.

Similarly, EPA indicates in Section 2.2.2.1, "EPA regional screening levels (RSLs) for tap water (EPA 2014) were used as the risk-based PRGs for RAOs 3 and 4." However, only a few chemicals were found to pose potentially unacceptable risk in the BHHRA for the scenarios addressed by RAO 3, and no chemicals were found to pose potentially unacceptable risk for scenarios addressed by RAO 4. Consequently, risk-based levels are not necessary or appropriate for most of the chemicals listed by EPA for RAO 3, nor are risk-based levels necessary for RAO 4. (And for reasons noted in the LWG's June 2014 comments, the LWG disagrees that PRGs are needed for the groundwater RAOs at all.)

These are just a few examples of EPA performing evaluations that ignore reasonable risk management approaches or are inconsistent with the BLRAs or with the basis for the potential ARARs which EPA appears to be applying, which severs the link to a risk-based cleanup as clearly called for in the guidance (EPA 2005; p. 1-5).

EPA Response:

The EPA's Contaminated Sediment Guidance Highlight 1-4 (USEPA 2005) provides Risk Management Principles Recommended for Contaminated Sediment Sites as follows:

1 - Control sources early. 2 - Involve the community early and often. 3 - Coordinate with states, local governments, Indian tribes, and natural resource trustees. 4 - Develop and refine a conceptual site model that considers sediment stability. 5 - Use an iterative approach in a risk-based framework. 6 - Carefully evaluate the assumptions and uncertainties associated with site characterization data and site models. 7 - Select site-specific, project-specific, and sediment-specific risk management approaches that will achieve risk-based goals. 8 - Ensure that sediment cleanup levels are clearly tied to risk management goals. 9 - Maximize the effectiveness of institutional controls and recognize their limitations. 10 - Design remedies to minimize short-term risks while achieving long-term protection. 11 - Monitor during and after sediment remediation to assess and document remedy effectiveness.

The EPA's Contaminated Sediment Guidance, Chapter 7, provides guidance for risk management in remedy selection. This process includes weighing the trade-offs of the balancing criteria of the NCP. It also provides the basis for selecting RGs based on background. The FS provides the fundamental science to support risk management decisions. EPA is following its guidance in conducting an FS that strictly follows the scientific principles in its guidance.

Scales for evaluation of PRGs:

Given that receptors can be found anywhere in the river and most move around the river, the PRGs are selected to be applied site-wide, not for specific areas of the river to be protective of human health and the environment. The PRGs are selected to achieve each RAO. The spatial scales are established for the RAO, not for the individual species. The RAO is meant to protect all receptors covered by that RAO.

The human health baseline risk assessment determined that there were contaminants posing risk at the site outside of EPA's cancer risk range and noncancer hazard quotient. Therefore, PRGs for cancer risks to humans are set at the 10^{-6} level consistent with the NCP, which states that a risk of 10^{-6} represents the point of departure for determining remediation goals for alternatives. EPA has further clarified that the 10^{-6} level is the point of departure and the 10^{-4} level is for information purposes in Appendix B1. As a starting point, the most conservative PRG is selected; however, the evaluation in the FS will determine if these numbers are achievable by the alternatives. Only through the appropriate FS analysis can these numbers be further refined so that the rationale is scientifically justified and consistent with CERCLA, the NCP, EPA guidance and policy.

Also, as EPA has stated in many meetings with the LWG, the alternatives will be evaluated on many spatial scales to assess protectiveness and effectiveness. EPA shared those spatial scales with the LWG in July 2014.

The map presented in Figure 2.2-2 is merely to show where sediment concentrations exceed the initial PRGs selected for the RAOs, and thus represent areas that will be further evaluated in the FS. These areas will be evaluated for all General Response Actions (GRAs), including institutional controls, containment in place, *in-situ* treatment, removal, confinement/disposal and monitored natural recovery. The alternatives are being developed in section 3 of the FS present a range of alternatives that each one includes a combination of all the GRAs, except the no action alternative. EPA is using site-specific environmental and physical conditions to assign the preferred GRA to various areas of the site. The vast range of environmental and physical conditions throughout the site does not allow for a single GRA to be used throughout the entire study area.

2012 Fish Data:

The upstream smallmouth bass collected by the LWG in 2012 were analyzed for PCBs in whole body of nine fish collected between RM 15 and RM 17. In 2002, six smallmouth bass were collected, three from RM 21 to RM 24, and three from above Multnomah Falls. These six fish were analyzed for multiple contaminants. As previously discussed with the LWG, EPA's review

of the data concludes that at only RM 5W are PCB concentrations in smallmouth bass within the same range as those measured in the upstream data.

EPA will consider these data at the appropriate point in the FS process. EPA is not convinced that a sufficiently robust data set exists to compute a background concentration in fish tissue. EPA plans to use the LWG's FWM to determine what the tissue concentrations are expected to be based on the resulting post remediation sediment concentrations from the evaluations of each remedial action alternative. The outcome of the FS evaluation and using risk management, EPA will determine the final remediation goals/cleanup levels to present in the proposed plan.

Oregon Water Quality Standards:

EPA is basing its evaluation on the water data collected by the LWG for the RI/FS. Evaluation of the water data shows trends in the site that point to areas needing sediment remediation. When the data is averaged across the site, as was done by the LWG, it is difficult to discern the appropriate areas to take remedial action. Site-wide averaging is not consistent with how water quality standards are applied. The LWG's comment that PRGs based on Oregon's water quality standards should be applied like the state would apply them does not affect the decision identifying the standards as ARARs and PRGs. The final ARARs and final remediation goals/cleanup levels are identified in the ROD. Sampling and long-term monitoring to confirm achievement of RAOs will be determined during design and implementation of the remedy.

With respect to the specific comment regarding mixing zones, mixing zones have no application to uncontrolled releases of hazardous substances and other circumstances currently existing at the site.

Pore water is very closely associated with surface water, and the Oregon AWQCs are meant to protect aquatic life that reside in or on sediments and are exposed to sediment pore water as well as all biota that live in the surface water.

Use of Regional Screening Levels:

EPA establishes cleanup levels for contaminants that have the potential to pose unacceptable risk based on measured concentrations in the groundwater plumes or are present at concentrations greater than ARARs. EPA is using RSLs for contaminants in surface water or groundwater that do not have an MCL or MCLG. The RSLs are risk-based and set at either a cancer risk of 10^{-6} or an HQ equal to 1.

4. Background Values for Surface Water and Transition Zone Water (TZW)

EPA should develop background values for surface water using available upstream surface water data and develop background values for TZW using the considerable body of research literature from other sites regarding the concentrations of contaminants in non-CERCLA or non-contaminated sites. Currently, EPA's draft revised FS Section 2 presents many surface water and TZW (which EPA referred to as "porewater") PRGs that are well below likely ambient surface water (e.g., upstream river water) and TZW levels; therefore, these PRGs are unachievable, which is inconsistent with guidance. Specifically, EPA guidance (2005: p. 2-15) indicates that

RAOs should be achievable by the site cleanup itself. PRGs are the numeric expression of the RAOs as EPA describes in revised FS Section 2.2.

EPA Response:

Regarding background surface water concentrations, the LWG only collected 3.5 data points from the upriver reach at RM 16. This is insufficient data to compute robust and defensible background concentrations for contaminants in surface water. However, the data that was collected will be used in conjunction with the background sediment and upriver sediment traps to evaluate the ability of each of the remedial action alternative to achieve PRGs.

Transition zone water is not a media is by definition representative of the flux between surface water and groundwater. Thus, contaminant concentrations are dependent on specific local environmental conditions, and EPA does not consider it appropriate to calculate background concentrations.

5. Background Values for Dioxin/Furan (D/F) Sediment PRGs

Ultimately, the remediation goals should consider the risk-based PRGs and background. The LWG requested that EPA compare the D/F sediment PRGs to background and, as required, adjust the PRGs to background. EPA subsequently indicated in FS technical meetings that EPA considered the background dataset to have too many non-detects to calculate valid background values. EPA established detection-limit-based PRGs instead for some D/F congeners. The LWG understands that there is a relatively high level of non-detects in the background dataset; however, valuable information is contained within that dataset regarding detectable levels of D/Fs found upstream of the Site that clearly relates to achievable levels within the Site. If this dataset is used consistent with the equilibrium concept discussed previously, some of the rigid statistical requirements EPA is concerned about could be addressed through other means to provide an understanding of background conditions. At a minimum, understanding the range of background concentrations and the potential for upstream contributions is critical to evaluating remedy feasibility and effectiveness. Basing D/F PRGs on extremely low risk-based or detection limit values that may be below the range of background conditions continues to overlook the guidance requirement for achievable RAOs (EPA 2005; p. 2-15) and PRGs (which are the numeric expression of RAOs), and will very likely result in the establishment of remedial levels that are unattainable.

EPA Response:

Background sediment concentrations for dioxin/furans will be calculated in a manner consistent with Mr. Albright's background dispute decision. Based on that information, EPA will adjust the PRGs to reflect the "background" levels for dioxin/furans and the other contaminants. EPA notes that the background dataset for dioxin/furans shows that they are infrequently detected, and in the case of some, such as 2,3,7,8-TCDD, were not detected at all in upstream samples.

6. Evaluate Remedial Alternatives with PRGs Applied on Appropriate Spatial Scales

The LWG requested that EPA evaluate remedial alternatives using risk-based PRGs applying the same spatial scales as the risk calculations in the risk assessments. EPA has indicated that this issue will be addressed in FS Section 4. Given that EPA's draft revised Section 2 already has examples of misapplication of the PRGs (see Comment 3), the LWG urges EPA to begin discussions on this issue now in order to ensure an adequate foundation for the significant technical evaluations necessary to adequately evaluate appropriate spatial scales in Sections 3 and 4.

EPA Response:

Refer to EPA response to LWG comment #3.

7. Include the Site Use Factor in Calculation of Sediment Direct Contact PRGs

The LWG requested that EPA include the site use factor in the calculation of the sediment direct contact PRGs for fisher scenarios used by EPA to develop PRGs under RAO 1, consistent with the BHHRA. EPA continues to exclude the site use factor in the PRG calculation, which is inconsistent with the EPA-approved BHHRA. The oral justification for excluding the site use factor that EPA provided in FS technical discussions was that the in-water sediment PRGs would not necessarily be protective of the fisher scenarios if the site use factor was included. It is unclear to the LWG how the BHHRA risks can be calculated correctly with inclusion of the site use factor for this scenario, while a PRG back-calculated in the identical manner would somehow not be protective for this scenario.

EPA Response:

Application of a site-use factor for beaches results in a PRG that is 4 times greater than would be calculated for individual beaches when exposure is averaged across all possible exposure areas. Neither the LWG nor EPA has information that show that potential receptors visit all possible beaches in an equally portioned manner.

8. Calculation of D/F PRGs in Sediment

The LWG proposed some general methods for calculating D/F risk-based PRGs in the June 2014 comments. EPA moved ahead with a D/F PRG development approach, which is described in a CDM Smith working draft memorandum dated December 23, 2014. The LWG disagrees with the PRG methods described in this memorandum for numerous reasons, which can be fully described if necessary. In summary, some key reasons for our disagreement include:

- The models that EPA used to develop PRGs are initial calibrations that have not yet been checked and adjusted for consistency in parameterization across calibrated congener models.
- In selecting congeners for PRG development EPA ignored two of the three congener selection considerations that the LWG developed collaboratively with EPA in 2009.

- EPA failed to recognize clear spatial patterns of congener concentrations in smallmouth bass tissue. It developed a PRG methodology on the false assumption that such patterns did not exist.
- EPA correctly noted the lack of correlations between sediment and tissue congener concentrations, yet applied a PRG approach that depends on the assumption that sediment congener SWACs and tissue congener concentrations are correlated.

EPA Response:

The model used by EPA to develop PRGs is the LWG's calibrated FWM with the congener-specific input values provided by the LWG on August 22, 2014. The comment is not clear which of the two congener selection considerations the LWG is referring.

As EPA explained in an email to the LWG on August 15, 2014, EPA first looked at the spatial patterns in the smallmouth bass tissue to discern the congener patterns and select the specific congeners for further evaluation. EPA noted that the specific congener concentrations in sediment did not correlate to the specific congener concentrations in tissue. This is because individual congeners bioaccumulate at different rates. It is precisely for this reason that EPA determined it was most appropriate to calculate PRGs for individual congeners instead of total dioxins/furans or dioxin/furan TEQ. If the LWG is asserting that there is a lack of correlation between sediment and tissue congener concentrations, EPA is unclear why the LWG provided calibrated FWMs on August 22, 2014, for each of these five congeners for EPA to use in developing these PRGs.

9. Benzo(a)Pyrene Equivalent (BaPEq) PRG for Shellfish Consumption

The LWG requested that EPA express the BaPEq PRG based on human health clam consumption (RAO 2) on an organic carbon normalized basis, similar to the Focused PRGs EPA provided for the draft FS. The LWG also requested that EPA not use the clam consumption PRG as a "surrogate" for vertebrate fish consumption because it is not in any way applicable to a fish consumption scenario. EPA has neither revised the PRGs to address this comment nor explained the technical basis for its approach.

EPA Response:

EPA calculated a PRG for cPAHs to address unacceptable risks associated with consumption of shellfish, and we anticipate that this PRG will also address the unacceptable risks identified in the BHHRA associated with consumption of fish. While EPA developed the PRG based on normalization of organic carbon and lipid content, the PRG was converted to a dry weight concentration consistent with the other PRGs.

10. Benthic Risk PRGs Should Be Based on the Comprehensive Benthic Risk Area (CBRA) Approach

The LWG requested that, instead of using individual chemical sediment benthic PRGs for RAO 5, EPA develop a PRG that is based on the CBRA approach, to which EPA previously agreed. Specifically, EPA's letter on February 25, 2011 states, "All significant issues regarding use of

the LRM and EPA's comments were resolved in principle as of December 13, 2010. The benthic approach agreed to is documented in Attachment B to LWG's January 12, 2011 letter. EPA is in general agreement with the approach as described in Attachment B to the LWG's letter with some clarifications that are provided as an enclosure to this letter." In addition, EPA approved the Final BERA, which concludes that "[p]otentially unacceptable benthic risks are highly associated with shoreline areas, slips, and areas of elevated chemical concentrations and represent approximately 7% of the total Study Area." EPA's approach of using individual SQVs as benthic PRGs will result in identification of potentially unacceptable benthic risk in the revised FS that is completely inconsistent with the EPA-approved findings in the BERA. In the June 2014 comments, the LWG made a specific recommendation regarding methods to derive PRGs consistent with the CBRA, but EPA did not make any related changes to its benthic PRG methods.

DEQ indicated in the March 17, 2015 meeting with EPA and LWG on Section 2 that there should be consistency between the RAO 5 PRGs and the CBRA (or alternatively to a benthic risk approach that the parties finally agreed to). The LWG agrees with DEQ that there needs to be consistency between the RAO 5 PRGs and the CBRA. It is confusing and inconsistent for EPA to define Sediment Management Areas (SMAs) using the CBRAs (which is presumably still EPA's intent), and then present an entirely different and technically inappropriate method for deriving benthic risk PRGs.

EPA's draft revised Section 2 further highlights the LWG's ongoing concern, given that EPA appears to have used individual benthic PRGs in Figure 2.2-2 to identify apparent ecological risk areas that are completely inconsistent with the agreed to CBRAs. Benthic risk PRGs are used in the development of this figure, which suggests that benthic risk exists over much greater than 7% of the total Study Area as concluded in the EPA-approved BERA. EPA indicated in the March 17, 2015 meeting on Section 2 that EPA intends the PRGs under RAO 5 to be surrogates for all ecological sediment direct contact risks. However, the vast majority of the RAO 5 PRGs are based on benthic risk endpoints and do not provide any direct indication of potentially unacceptable risks for other ecological receptors.

EPA Response:

EPA is eliminating the PRGs based on the LRM from Table B-2 and is not considering them in the development of the numeric PRGs. EPA is also not using the CBRA approach to develop numeric PRGs. The CBRA approach looks at risk from concurrent exposure to multiple contaminants rather than on an individual contaminant basis. In conducting the evaluation of effectiveness and protectiveness on a contaminant-specific basis, EPA is going to use the values selected for the PRGs. Those values for RAO 5 will be evaluated on the SDU scale and on the rolling 0.5 mile by side of river scale, rather than on a point-by-point scale. This has all been fully discussed with the LWG during several meetings during 2014.

11. Technology Criteria, Scoring, and Technology Assignments

The LWG requested in 2014 that EPA discuss with the LWG the issues of technology criteria, selection scoring, technology assignment, and, in particular, the evaluation of monitored natural

recovery (MNR), which was not discussed in any of the 2014 FS technical meetings. EPA proceeded with development of a draft technology screening subsection within Section 2. The LWG views much of the draft technology screening discussion in the draft revised FS Section 2 as a biased and selective description of the pros and cons of many of the technologies. Additionally, the screening discussion lacks necessary site-specific information and analysis. EPA guidance states that the technology screening process step is site specific and should be based upon information from the RI site characterization (EPA 1988: p. 4 – 16).

The LWG recommends that EPA employ an approach to describing the pros and cons of each technology similar to EPA's recent Community Advisory Group (CAG) presentation on MNR, which included pros and cons side by side using text from EPA's sediment remediation guidance. The LWG recommends that a similar approach for general technology screening be used in Section 2, and this should replace much of the relatively subjective text currently presented by EPA for these technologies. Because such pros and cons would be directly from guidance, this would ensure LWG and EPA agreement with the general evaluations of each technology in Section 2. The one exception to using the 2005 guidance is for in situ treatment, where the guidance is outdated (see Comment 22).

The following subsection presents additional major issues that the LWG has identified now that a draft of the revised Section 2 is available for review. Some of these issues are related to the previous comments summarized above, but the following comments discuss some new aspects of the LWG's concern based on EPA's draft revised Section 2.

EPA Response:

Much of the information provided in the screening tables was provided to the LWG in 2011 and is provided in the LWG's draft FS. EPA did a site-specific screening of the technologies. EPA is not scoring the technologies. EPA is unclear what the LWG's issues are regarding MNR, it is retained as a technology/remedial component of to be considered in developing alternatives. It is also not clear how citing general pros and cons contained in guidance for a particular GRA provides a site-specific analysis. In Section 3 of the FS, the specific areas identified for MNR will be developed for each remedial action alternative. This is conducted using the technology screening EPA presented to the LWG in July 2014.

12. Additional PRG Changes

EPA made numerous new changes to the PRGs tables since the last version provided by EPA to the LWG on August 6, 2014. At that time, EPA noted that the PRGs were still under evaluation and subject to change. However, given that the PRGs table for the revised FS had been under development by EPA since November 2013 (when EPA first presented a version of the PRGs for the revised FS), and EPA provided and discussed with the LWG multiple iterations of the PRGs, the LWG had a reasonable expectation that any additional changes to the PRGs would be relatively minor. Instead, EPA's draft revised Section 2 Table 2.2-1 contains 196 numeric PRGs, with 80 of the values presented are different from those presented in the draft table on August 6, 2014. Also, as noted above, the number of COCs and PRGs has increased since the last PRGs

table, indicating that EPA is not using risk management principles as is commonly done at other sediment cleanup sites.

Conversely, many of the specific changes recommended by LWG have not been adopted. A particularly problematic (but not the only) example is that EPA made no changes to the manganese water PRG for RAO 8. The LWG submitted a very detailed technical analysis on August 1, 2014, indicating needed changes to this PRG, which EPA indicated it was willing to consider. EPA indicated at the March 17, 2015 meeting that EPA intended to change this PRG and not doing so was an oversight. The LWG recently re-submitted to EPA our specific request regarding changes to this PRG.

In general, the LWG requests that it be provided the rationale and calculations that were used to develop the revised PRGs for existing PRGs that were altered in the table.

EPA Response:

The term "relatively minor changes" is subjective, and since as noted in its comment the LWG was aware that PRGs were still under development and subject to change, it is not clear why the LWG did not anticipate additional revisions to the PRGs. As indicated in the March 17, 2015 meeting, EPA intends to revise the manganese PRG for RAO 8. The LWG has already requested the PRG be revised, and now has done so again. That PRG will be revised in the subsequent revisions to FS section 2. Further, EPA is including the LWG's memo for developing the manganese surface water PRG as an Attachment to Appendix B2. The rationale and calculations for PRGs are provided in Sections 2.2.2.1 and 2.2.2.1, and Appendices B1 and B2.

13. Changes to RAOs Text

EPA made new major changes to the RAOs, which were not discussed in the 2014 FS technical meetings. The draft FS RAO text was laboriously discussed, and the LWG and EPA exchanged multiple comments and responses from January to September 2009 to refine and finalize the RAO text. The LWG comments included text on "additional considerations" that further explain the RAOs, which EPA agreed would accompany the RAO text. EPA provided very little explanation at the March 17, 2015 meeting for why these prior agreements and EPA directions are no longer valid. The following are some of the specific LWG concerns with the new RAO text:

- EPA has removed all of the "additional consideration" language that EPA directed the LWG to use in a letter on September 30, 2009. As noted above, this additional language provides critical explanation for the interpretation of the RAOs and how they should be used in the FS. The most important additional consideration no longer explained in the draft revised Section 2 is that the RAOs require risk reduction at the site through sediment remedies, and that other sources of risk (e.g., upland and watershed sourced contaminants) also exist that the sediment remedy cannot directly address.
- EPA added language about "riverbank soils" to three of the RAOs and removed the definition of "site sediments." The definition of site sediments is important clarifying information regarding the subject of the remedy (i.e., contaminated sediments that reside

below an elevation of 13.3 feet Mean Low Water North American Vertical Datum of 1988 [MLLW NAVD88]). By removing this definition and including "riverbank soils," EPA has obscured which contaminated media the remedial alternatives are intended to address. As a result, it appears EPA is suggesting addressing riverbank soils above 13.3 feet MLLW NAVD88, which are not subject to the Administrative Settlement and Order on Consent (ASAOC) and were, for that reason, not investigated in the RI. The regulatory approach to riverbank soil cleanup and the variations in riverbank soil cleanup approaches that exist at various sites along the river need to be clarified and made consistent with the authority of the ASAOC and the existing February 2001 Memorandum of Understanding between EPA, DEQ and their partner agencies. EPA provided some oral explanation on March 17, 2015 for some of these changes and how EPA now intends to approach riverbank remediation in the revised FS alternatives. The LWG continues to disagree with these RAO changes based on EPA's recent oral explanations, and regardless, points out that the current draft revised FS Section 2 does not describe the river bank approach orally described by EPA on March 17, 2015.

- EPA changed the general format of the RAOs from language about "reducing risk to acceptable levels" (through sediment remedies as discussed previously) to language about "reducing COC concentrations" in riverbank soils, surface water, biota, and sediment. This change makes soil, surface water, biota, and sediment concentration reductions the explicit goals of the remedy. The LWG fundamentally disagrees that concentration reductions are the only, or even primary, way that the RAOs can or will be achieved. Consistent with a risk-based framework for sediment remedies (EPA 2005; p. 1-5), the RAOs should focus on reduction of risks to acceptable levels, where possible. Further, the LWG disagrees that PRGs in surface water, riverbank soil, and biota are the primary objective of the remedy. Previously, EPA had indicated in FS technical discussions, and the LWG agreed, that levels in surface water and biota would be considered "targets" (not PRGs), given that a sediment remedy alone may not be able to achieve acceptable levels in these media. EPA appears to have abandoned that approach with the new RAO language and directly links success of the sediment remedy to achieving specific concentrations in surface water and biota. Further, the RAOs imply that acceptable risk levels will be achieved using the sediment, water, and biota PRGs, but some of the PRGs are based on background values and still present unacceptable risk.
- Edits to groundwater RAOs specify that the groundwater PRGs are measured in porewater. In the draft revised Section 2, EPA defines porewater as water residing in the sediment biologically active zone (p. 2-10). This approach and definition of porewater is different than the definition of TZW, defined as the top 30 centimeters, which is used throughout the RI/FS. EPA previously required the field sampling and analysis for groundwater impacts in the RI/FS to focus on TZW, which may not relate directly to concentrations in biologically active zone porewater. These TZW values were used in the Baseline Ecological Risk Assessment (BERA) to estimate risks to ecological receptors in the biologically active zone, but given the differences between TZW and biologically active zone, the results of these risk estimates cannot be used to define COCs. Also, in human health RAO 4, EPA indicates that MCLs and AWQC are the PRGs as measured in

porewater, but those criteria are not applicable to porewater, given the point of exposure to people will be in the surface water and, for drinking water, at point of use. Regardless, the LWG does not agree there should be any PRGs for groundwater at the site, for reasons discussed in our June 2014 comments.

EPA Response:

EPA Region 10 has modified the RAOs in consultation with EPA HQ to be consistent with EPA policy and guidance and other sediment remedies.

The additional considerations appeared to be risk management recommendations, thus they were eliminated from the RAO discussion. The RAOs themselves clearly define that risk reduction is the primary goal and will be achieved by reducing concentrations of COCs to acceptable levels. EPA has also added language that clarifies achieving the RAOs relies on the remedial alternatives' ability to meet achievable final remediation goals/cleanup levels derived from PRGs. At this point Table 2.2-1 provides PRGs which are based on such factors as risk, ARARs, and background. PRGs may be further modified through the evaluation of alternatives and the remedy selection process. Final remediation goals/cleanup levels will be selected in the Record of Decision.

EPA has developed a new RAO for riverbank soils. This clarifies the media of which the RAO is meant to address. The AOC does not limit the selected remedy to river sediments. EPA is using information in the risk assessment that demonstrate that contamination in riverbanks pose an unacceptable risk via recontamination, and therefore action under CERCLA is warranted.

Reducing contaminant concentrations in the environment is the primary means for achieving remedy protectiveness. EPA disagrees with the LWGs interpretation that reductions in contaminant concentrations should not be a primary component of the remedy. Since tissue concentrations in fish represent a primary source of risk to human and ecological receptors, they also represent the most direct manner through which to assess risk reduction. EPA believes that reductions in surface water and biota concentrations will be achieved through reductions in sediment and riverbank soil concentrations and ongoing source control efforts. EPA will continue to consider how the remedy will address tissue and surface water concentrations.

The only water media at the site are groundwater and surface water. TZW and pore water are not environmental media. TZW is the area in which groundwater and surface water mix beneath the sediment/surface water interface. Pore water is the location in the sediments where benthic organisms are likely to reside. The establishment of PRGs in pore water for RAOs 4 and 8 are meant to protect the river from releases of contaminants in groundwater. The BERA used the information to determine where ecological risks were potentially unacceptable. Elevated concentrations in pore water are indicative of potential risk to benthic organisms, and releases to surface water.

14. Surface Water and Tissue PRGs

In addition to the changes in the RAO text, EPA changed surface water and tissue "target levels" in the August 2014 version of Table 2.2-1 to "PRGs." EPA is reversing past agreements that these media, particularly biota, should not be subject to remedial goals. The LWG has specifically previously commented that only sediment levels should be referred to as PRGs because other chemical sources impact water and tissue levels. Combined with the RAO language changes, the draft revised Section 2 now explicitly suggests that certain surface water and biota concentrations are remedial goals, and eventually cleanup levels, for the site.

EPA Response:

Refer to EPA responses to LWG comments #3 and #4.

15. Target Areas and Volumes for Remediation

EPA described in the March 17, 2015 meeting that EPA identified areas selected for "remediation" in Section 2.2.6 by mapping the lowest PRGs on a point-by-point basis and identifying the volume of remediation by apparently assuming 10 feet of removal over the entire study area. (It is noteworthy that the draft revised FS Section 2 text does not explain or refer to any place the reader can find an explanation of this remediation area mapping, or the volume determinations.) The areas mapped in Figure 2.2-2 are inconsistent with the risk assessments and represent a fundamental misapplication of the PRGs at inappropriate spatial scales. Also, the stated volume in no way relates to volumes of sediment that may pose risk or likely future risk.

EPA Response:

Per EPA guidance (USEPA 1988) an initial determination is made of areas or volumes of media to which general response actions might be applied during the development of alternatives. This initial determination is made for each medium of interest at a site. To take interactions between media into account, response actions for areas or volumes of media are often refined after site-wide alternatives have been assembled. EPA has removed the volumes from the text of the FS, but has retained the acres. The map is showing the areas where the current initial PRGs are exceeded. EPA will be assigning various technologies, including MNR, to address areas of the site to meet these PRGs to ensure adequate risk reduction. EPA will clearly identify the areas (acres) of the site where each technology will be applied in the alternative development (Section 3 of the FS).

Refer to EPA responses to LWG comment #3 regarding appropriate spatial scales.

16. Inconsistent Development of Fish/Shellfish Consumption PRGs

In Appendix B1 Section 1.2.1, EPA presents one PRG calculation for fish and shellfish consumption PRGs. Consumption rates are different for fish and shellfish, and EPA has indicated that a shellfish consumption rate was input to this calculation to develop the shellfish consumption sediment PRG for carcinogenic polycyclic aromatic hydrocarbons (cPAHs). (EPA has indicated that the cPAH sediment PRG is the only one based on shellfish consumption.) However, the tissue PRG EPA presents in Table 2.2-1 for cPAHs is based on fish tissue with a

value of 0.05 µg/kg ww. Given that the sediment PRG for cPAHs is for clam consumption, the tissue PRG should also be based on shellfish consumption and should be changed to a value of 7 µg/kg ww. Also, aldrin is a COC only for shellfish consumption, so the aldrin tissue and sediment PRGs should be based on shellfish consumption, not fish consumption as EPA currently presents. EPA needs to provide clear sediment and tissue PRGs in PRG development for fish or shellfish consumption that do not confuse these two pathways.

Similarly, EPA's draft revised FS Section 2 indicates that "[r]isk-based PRGs protective of fish/shellfish consumption were not developed for arsenic, mercury, BEHP, and PDBEs because a relationship between tissue and sediment concentrations could not be determined." However, EPA presents other PRGs that have this same lack of relationship. For example, as noted above, EPA presents for cPAHs a sediment PRG based on clam consumption as a "surrogate" for fish consumption risk and a tissue PRG for fish tissue (instead of shellfish tissue). Site data indicate there is no relationship between levels of this COC in sediments and fish tissue, and EPA has orally agreed in FS technical meetings. Because the fish and shellfish consumption scenarios are completely different, the cPAH sediment PRG proposed by EPA does not address this lack of relationship between fish and sediment. EPA should be consistent in the determination of fish consumption PRGs across all chemicals.

Also, EPA should maintain consistency with other regional EPA cleanups. Specifically, the Lower Duwamish Waterway (LDW) Record of Decision (ROD; EPA 2014) concludes that development of a sediment cPAH PRG for the human health seafood consumption pathway was inappropriate because there is no observable relationship between cPAH sediment and tissue concentrations. The LDW ROD discusses the need for future investigations of the sediment/ tissue relationships for cPAHs (EPA 2014). Therefore, EPA defined the LDW sediment cleanup footprint based on other cleanup levels for PAHs (e.g., human direct contact with sediment).

EPA Response:

The sediment PRG of 3,950 µg/kg for cPAHs is based on a shellfish consumption rate of 3.3.g/day and a target tissue concentration of 7.1 µg/kg. Table 2.2-1 will be revised to reflect this change. Aldrin is retained as a COC for fish consumption because it is rapidly converted to dieldrin in the environment and organisms, and dieldrin poses unacceptable risk humans via consumption of fish.

The LWG erroneously states that EPA "orally agreed" in FS technical meetings that there is no relationship between PAHs in sediment and fish tissues. In fact, EPA has long maintained that there is a clear relationship between PAHs in sediment associated with the MGP waste at the NW Natural site, and reported PAH concentrations in small home range fish collected from that area. Further, as EPA has stated, it appears apparent lack of a relationship between sediment and tissue concentrations is because LWG attempted to establish a relationship only on a site-wide scale, rather than on a localized scale. EPA has also "orally stated" in FS technical meetings that the observed relationship between PAHs in sediment and fish at NW Natural is possibly the result of saturation of enzymatic metabolic pathways, and that tissue PAH concentrations were most likely represented by a threshold relationship. Thus, PAH concentrations less than the

threshold would likely not be associated with PAHs in tissue. The range of this threshold might be ascertained by examining measured PAH concentrations in sediment in other areas of the site where co-located tissue samples are non-detect for PAH compounds. In the absence of this or a similar analysis, EPA has established a sediment PRG for PAHs based on the unacceptable risks identified in the BHHRA associated with consumption of shellfish. Since a more linear relationship was established between PAH concentrations in sediment and shell fish tissue, EPA is satisfied that the PRG based on consumption of shellfish is likely protective of consumption of PAH-contaminated fish from RM 6W.

17. Use of Bioaccumulation Water Criteria for Surface Water and Groundwater PRGs

EPA is using organism + water bioaccumulation criteria for human health surface water and groundwater PRGs (RAOs 3 and 4). EPA previously agreed in FS technical discussions that organism-only criteria should be used and shown under the bioaccumulation RAO (RAO 2) only. EPA further agreed that direct contact/water ingestion criteria should be used for surface water and groundwater PRGs, as shown in EPA's last version of the PRGs table (August 6, 2014). EPA has now reversed this decision and changed the surface water and groundwater PRGs for RAOs 3 and 4 back to organism+water values. EPA mentioned at the March 17, 2015 meeting that this change was made because PRGs should be media-specific not pathway specific. The LWG does not understand this explanation or how it is consistent with regulations and guidance or with how EPA assigned other PRGs to the various RAOs.

EPA's water PRGs are now often the same across RAOs 2, 3, and 4. However, confusingly, the values of the PRGs are sometimes different in RAOs 3 and 4 compared to RAO 2. For example, for cPAHs, a criterion of 0.0018 micrograms per liter (µg/L) is shown in RAO 2, but a criterion of 0.0013 µg/L is shown in RAOs 3 and 4 (see also DDx for a similar situation). EPA indicates in two different places that it is using organism-only criteria for RAO 2 and organism + water criteria for RAOs 3 and 4, but does not explain the reason for this difference and how it relates to differences of the RAOs.

Confusingly, EPA indicates the following in Section 2.2.2.1: "EPA regional screening levels (RSLs) for tap water (EPA 2014) were used as the risk-based PRGs for RAOs 3 and 4." But then it indicates in Section 2.2.3 that "[t]he PRGs for RAOs 3 and 4 were selected from the State of Oregon AWQCs (organism + water) and MCLs presented in Table 2.1-4." The various draft revised FS Section 2 tables show RSLs, Maximum Contaminant Levels (MCLs), and bioaccumulation Ambient Water Quality Criteria (AWQC), but the process for selection of any particular value for RAOs 3 and 4 is not clearly defined in the supporting tables or text.

EPA Response:

EPA had previously agreed to adding organism only HH AWQCs for RAO 2. After further discussions with EPA HQ, it was determined that RAO 3 covers all uses of surface water. Thus, surface water for RAO 2 has been removed. The organism+water HH AWQCs and MCLs are protective of all uses of the surface water, so those values are being used to develop PRGs for surface water. RSLs are only being used for COCs that do not have a criterion for organism+water HH AWQCs or MCLs. EPA has further modified the RAOs and has provided

additional language to help clarify this. While some values may be the same for RAOs 3 and 4, there are different COCs and where and how they are applied is different.

18. Potentially Unacceptable Risk

EPA refers in multiple locations to contaminants posing unacceptable risk (e.g., last sentence of the first paragraph of Section 2.2.1). This and any similar language should refer to potentially unacceptable risk. This is not an issue of semantics; contaminants with HQs greater than or equal to 1 were not identified as posing unacceptable risks in the BERA. Similarly, the BHHRA determined potentially unacceptable risks.

EPA Response:

The sentence referred to by the LWG has been deleted and replaced with different text that eliminates the need for this change.

19. Benthic Toxicity Narrative PRG

EPA indicates in Table B-2 that EPA is comparing the bioassay responses to negative control. This is technically incorrect. The toxicity thresholds were derived and applied based on comparison to reference envelope values (positive controls), which should be the basis for any narrative PRGs.

EPA Response:

This is being eliminated as a PRG and will be used as a RAL in Section 3. EPA will revise the text to note that survival must be statistically significantly lower than the reference envelope positive controls.

20. General Response Action (GRA) Descriptions

Per Comment 11, the LWG recommends that the descriptions of the GRAs and the remedial technologies adhere more closely to guidance to avoid potentially biased descriptions of the GRAs and technologies. Often, the GRA descriptions used in Section 2.3 appear to emphasize the cons of less intrusive technologies and the pros of the more intrusive technologies.

EPA Response:

The descriptions of the GRAs was developed using EPA guidance. It is unclear what LWG's objections are to the descriptions and what additional language they want added to provide a more balanced discussion.

21. In Situ Treatment Description

There is minimal description of the in situ treatment GRA. The text also indicates for this technology alone that site-specific pilot studies may be needed, although this technology has been well established in the last few years. The LWG's position is that in situ treatment does not require pilot studies to any greater degree than other technologies currently under consideration, particularly in comparison to ex situ treatment. For in situ treatment, the EPA guidance (EPA 2005) is significantly out of date, and new information consistent with more recent publications

should be summarized here (see the draft FS Section 6 discussions for a starting point). Also, the text confuses elements of in situ treatment and enhanced MNR, which should be described as distinct technologies as in the guidance.

EPA Response:

EPA will review the information presented in Section 6.2.4, and incorporate the information into the revised Section 2 as appropriate.

22. Dewatering Treatment Description

The wastewater treatment discussion in Section 2.4.3.3 makes assumptions about how dredge dewatering can be controlled and where it will be discharged (if at all) that are misleading and do not encompass the full range of technology options for dewatering. The text discusses wastewater treatment plants only, implying that this is the only way to manage dewatering. Many other approaches exist for handling and discharging dewater including, but not limited to, on-barge water treatment, addition of amendments to bind or absorb water, use of upland transfer or disposal holding areas to allow water to clarify before discharge, and discharge to publicly operated existing treatment facilities. Also, discharge mixing zones are commonly used on environmental dredging projects in combination with one or more of the above options, and this element of dewater discharge is not discussed at all.

EPA Response:

EPA will consider inclusion of the other suggested process options for dewatering in revisions to the text and tables of FS Section 2.

23. Retained Disposal and Ex Situ Treatment Options

Section 2.4.5 implies that EPA has retained three disposal options (off-site landfill, "a RCRA disposal facility," and a Confined Disposal Facility [CDF]) for development of alternatives. However, based on FS technical discussions, the LWG's current understanding is that EPA intends to develop alternatives in Section 3 that only include off-site landfills. It is unclear how Section 2.4.5 is consistent with EPA's intentions for Section 3 and what it means for the alternatives eventually developed there.

Also, in Table 2.4-2, the Arkema CDF should be retained as a disposal option. EPA does not provide a supportable technical argument against the Arkema CDF. Further, it is not in the spirit of the Arkema Engineering Evaluation/Cost Analysis and the recent Albright opinion regarding the Legacy Site Services (LSS) data collection work plan to screen out the Arkema CDF at this time. The LSS work plan will develop the data required to fully evaluate a CDF and, therefore, the CDF cannot be reasonably screened out at this time in absence of the work plan information.

Also, for ex-situ treatment technologies, EPA retained soil washing, despite the fact that it was screened out in the 2012 draft FS consistent with early draft technology screening tables provided to EPA. This technology was also evaluated extensively at other sediment cleanup sites (including the LDW) and screened out due to the lack of demonstrated success. It is particularly

ineffective when substantial fines are present in the sediments. EPA acknowledges in draft revised FS Section 2 that the site contains a large percentage of fines in many locations.

EPA Response:

EPA has retained both off-site landfills and CDFs as disposal options. The Port of Portland T4 CDF is retained as the representative CDF option for the site. The Arkema CDF was not retained because it did not meet all the design criteria required by EPA. Refer to the attached evaluation.

EPA has screened out soil washing.

25. Application of CBRA

While the CBRA integrates multiple lines of evidence and defines areas that may be the subject of further evaluation, testing to rule out false positives is essential.

EPA Response:

EPA is not using the CBRA to develop numeric PRGs in the FS.

References:

U.S. Environmental Protection Agency (USEPA). 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. EPA-540-G-89-004.

USEPA. 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA-540-R-05-012. December 2005.